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A REVIEW OF GENUS ZERENE HBN. IN THE UNITED STATES (LEPID., RHOPALOCERA)

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Two valid species of the genus *Zerene* Hbn. (dog-faced butterflies) are found in the United States, north of Mexico, but not reaching Canada. The best known of the two probably is *Zerene cæsonia* Stoll which occurs plentifully in the southern states, ranging northward up the Mississippi valley and extending westward sparingly through New Mexico and Arizona into California, where it has recently established an additional habitat in the Imperial Valley. Specimens have also been taken rarely as far north as the San Francisco Bay region. The other species is *Zerene eurydice* Bdv., which is found only in California, being particularly common in the San Bernardino mountains of southern California, also occurring northward, as first reported by various early writers, as far as Mendocino County. It can be said that *eurydice* is more of a mountain butterfly, while *cæsonia* prefers the plains and low altitudes. I cannot see enough constant difference between *cæsonia* as found in eastern United States and similar specimens taken in the West to make a racial separation. It is true that *cæsonia,* as found in New Mexico and Arizona and adjacent northern states, is less broadly marked, but similar specimens may be sorted out wherever *cæsonia* flies in quantity. In some localities in the East the under side appears more ruddy (perhaps a seasonal form) and the maculation heavier; in these particulars they differ somewhat.

Entomological writers in the past have always wondered just how near *cæsonia* and *eurydice* converge, or if there is a connecting link between them. Typical male *eurydice* is of course easily told from male *cæsonia* by its brilliant reddish sheen over upper side of primaries. This superficial difference is well known and has been shown for years by Edwards, Wright and

others in their colored plates. The distinction, or rather unity as I will show (compare fig. "X" on *cæsonia* plate with similar fig. "X" on *eurydice* plate) between the females, has never been worked out and that is the primary reason for this article, for I believe it is in the forms of this sex that a common ancestor may some day be traced.

Explanation of Plate 1. *Zerene eurydice* Bdv.

The genus *Zerene* is closely related to, and probably was formerly united with, the genus *Eurymus* (Colias). Aside from neurational variance, a character peculiar to the female, and superficial differences, they are practically first cousins. The *Eurymi* undoubtedly had their origin in northern or higher altitudes. They are considered mountain butterflies because the majority of the earth's valid species are found where cooler conditions prevail. Long habitation in cooler localities tends to lighten pattern, so we find *Zerene eurydice* with the weaker maculation only in the mountains, and showing the result of an extended existence under those conditions. Its females are immaculate or rarely marked and the males generally have clear secondaries. They represent as complete a reversion to prehistoric parentage, parallel with the *Eurymi,* as time and surroundings have allowed. Kindred species from the mountains of South America also show suppression of pattern, so I believe typical *eurydice* when compared with *cæsonia* will prove to be the elder of the two species, at least as they exist on the North American continent. The mountains of southern California where *eurydice* is found are not becoming any higher or colder; in fact, according to geology, there is every evidence of the opposite trend, especially as regards climate; therefore we find *eurydice* gradually adapting itself to a warmer era, as first evinced by its forms and transition forms.

As hinted above, an increased temperature promotes design and we find female *eurydice* thus responding to the stimulus by gradually and naturally copying the wing pattern possessed by its male. This is shown on the plate by form *masumbrosus,* figs. 1 to 6. These specimens are still considered uncommon, but may be estimated at 5 per cent of a season's catch. The darker the specimens the rarer they are, which is natural because time has not allowed for the proportionate increase in numbers of

the more matured individuals. *Masumbrosus* first displays itself as a dash of black along the costal margin, starting at the base of the wing on the upper side of primaries. This will be noted by examining fig. 1 and comparing it with typical ♀ *eurydice* shown at its left. So far I can record no specimen with maculation advanced beyond fig. 6, which itself is only advanced half as far as any typical ♀ *cæsonia*. A further comparison of form *masumbrosus* also shows an entire lack of any black border markings at outer margin on secondaries, there being only a submarginal row of spots and dashes thus far produced. Time alone in the distant future will tell whether an outer margin can be added, for certainly the environmental power of the present habitat has not been sufficient to date. However, there is evidence of continued development, and it lies within the future ability of form ♂ *lineainita* to force an average of its dark-lined secondaries upon the female and thereby open up and bring development to the outer margins of *masumbrosus* which would be comparable and parallel, probably, to the ancient descending stages of female *cæsonia*. Should assistance not be forthcoming for it, then the supposition is that *masumbrosus* has the quality for diverging from the present species *eurydice* into a future species even more different than *cæsonia* has developed into.

Form ♂ *lineainita* is rare in collections; only eight or ten specimens are known to exist. Form ♂ *bernardino* has been previously listed as a race. This is entirely incorrect as no females exist for it alone. Male *bernardino* and typical male *eurydice* fly together in the San Bernardino mountains and elsewhere. It is simply a black-margined form of the male and is in no sense a race or subspecies. It is illustrated on the plate by figs. A, B, and C. Tr. f. *fanniæ* is the result primarily of a melanifusistic agency affecting the male and in turn probably the female, strengthening the dark cell areas and bringing to *eurydice* a heavy cell pattern comparable to that found in both sexes of *cæsonia*. (Note figs. A to C of form ♂ *bernardino*, comparing the sequence of their cell areas with those in both sexes of *cæsonia*). Tr. f. *newcombi* represents a premature, yet eventual, ground color change from orange, found on present *eurydice*, nearly to the yellow found on *cæsonia*; the inference

being that *eurydice* will follow the trend of *cæsonia.* All butterflies have a graduated color change from red, orange or yellow through to white, and reverse. Chromatic sequence has been mentioned in former *Entomological News* articles.

Explanation of Plate 2. *Zerene cæsonia* Stoll.

As previously stated, *cæsonia* is a low altitude or plains butterfly. It has long since left its original mountain habitat to become indigenous in a warmer environment, spreading down from the hills over the semitropical plains of both North and South America. The female has almost perfectly acquired the darker patterns of the male, probably reaching its climax of development as shown by fig. 6. With its present warmer surroundings, rarely does it produce a lighter patterned, retrogressive strain such as form ♀ *immaculsecunda* which represents a reversion to its ancestral mountain first cousin *Zerene eurydice,* form ♀ *masumbrosus.* The ♂s of *cæsonia* also become slightly atavistic as illustrated by their secondary phases from figs. A to D. I have seen no ♂s which have absolutely unmargined secondaries. A form called *rosea* Roeber has been named which has small black stripes instead of the black marginal band on the secondaries. This is shown by fig. ♂ B and fig. ♀ 3. The illustrated specimens are from New Mexico. It has undoubtedly served the same purpose for *cæsonia,* as I have suggested above, that form ♂ *lineainita* serves for *eurydice.* The more level nature of the vast territories over which *cæsonia* has spread gives it an immense area of habitation, and its past colonization must have been fairly easy and rapid. There are millions of *cæsonia* as compared to hundreds of *eurydice* which only has its confined mountain districts to range upon.

Description of New Forms Mentioned in Above Text

Zerene eurydice Bdv. **masumbrosus,** form ♀ nov.

A sexual form occurring only among the females, having on the upper side of primaries a meager outline in black of a "dog face" of which the black spot of the cell reproduces the position of the "eye." This (male shadow) on the female follows the same style and contour as that found on the male. Extreme examples, other than the designated holotype, have a submarginal row of four or five obscure black spots on the secondaries;

occasionally a spot in this row opposite the cell may be connected with it by a dash of additional black. The under sides are as in typical ♀ *eurydice*.

Data: Holotype ♀, illustrated by actual photographic reproduction as fig. 3 on plate No. 1; from California; labeled "Eurydice ♀ var." (not in Hy. Edw.s' own handwriting) in the Hy. Edw. Coll., Am. Mus. Nat. Hist., New York.

Note: About a year ago I examined the type of *amorphæ* Hy. Edw. in his collection at the American Museum. Since then I have corresponded with Mr. Frank Watson a number of times about it and he has kindly had photos made of it for me. The type is a male and the type label is in Hy. Edwards' own handwriting on green label, which says: "Meg. eurydice, var. amorphæ Hy. Edw." The description of it by Hy. Edw. describes a male, but I feel that both his type and his original description represent a typical predescribed male *eurydice* Bdv. Henry Edwards thought that his one male specimen, when he described it, had a different "suffusion with richest purple," but Boisduval's prior type also has "un reflect violet changeant"; so the two are the same thing and thus *amorphæ* Hy. Edw. falls as a synonym directly under *eurydice* Bdv. William Beutenmuller, who published a list of the Edwards' types after his death, and who should know, says: "One male; Mendocino County, Calif.," for "*Colias eurydice,* var. *amorphæ* Hy. Edw."; consequently the real female specimens which have been thought to have been *amorphæ* have in reality up until the present time been without a name. So I am calling them form ♀ *masumbrosus,* meaning "male shadow," and am designating the holotype as the specimen which has lain in the Edwards' collection for years and which has been mistaken for its female, though Hy. Edwards never gave it that connection or evidently thought of describing it. I wish to thank Mr. Watson for assisting me to establish the identity of synonym *amorphæ*.

Zerene eurydice Bdv. **lineainita,** form ♂ nov.

Typical ♂ *eurydice* Bdv. has immaculate secondaries, free of any black design. Form ♂ *bernardino* Edw. has a black band at outer margin on secondaries which in some specimens is represented only by a thick line and in others by quite a broad marginal edge. This new form has no black band, but a series

of black streaks extending inward from the outer margin on each of the veins and nervules. These thin streaks are more noticeable nearer the costa where they extend inward about one-quarter the width of the wing. The under sides are as in typical ♂ *eurydice*.

Data: Holotype ♂, shown on plate No. 1; expanse, 54 mm.; San Bernardino mountains, California, July 3, 1924; in author's collection.

Zerene cæsonia Stoll, **immaculsecunda,** form ♀ nov.

Primaries: with greatly reduced black markings; outline of "dog face" not clear-cut, having outline at "forehead" incomplete. Secondaries: immaculate of all usual marginal designs, cell blotch remaining as usual. Wings beneath as in typical *cæsonia,* yet not over ruddy.

Data: Holotype ♀, shown on plate 2; expanse, 62 mm.; **Pinery Canyon, Arizona** (Kusche), September 23, 1927; in author's collection. One paratype ♀, shown on plate 2; expanse, 55 mm.; Willard, Missouri (Brower), September 27, 1917; in collection of Mr. A. E. Brower, Willard, Missouri.

Note: Seitz pictures what he evidently considers *helena* Reak. from Bolivia, South America. His ♀ looks something like the above-described form.

Check List Revision for United States species of Genus Zerene Hbn.
(See classification scale, ***Entomological News,*** November, 1927.)

Old Listing (By Barnes and Benjamin)	New Listing (Now proposed)
Zerene Hbn.	Zerene Hbn.
56. eurydice Bdv.	—. eurydice Bdv.
♂ *wosnesenskii* (Men.)	♂ *wosnesenskii* (Men.)
♀ *lorquini* (Bdv.)	♀ *lorquini* (Bdv.)
♀ *helena* (Reak.)	♀ *helena* (Reak.)
ab. fanniæ Gunder	♂ *amorphæ* (Hy. Edw.)
gen. æst. amorphæ (Edw.)	*f.* ♂ bernardino (Edw.)
a. bernardino (Edw.)	*f.* ♂ lineainita Gunder
ab. newcombi Gunder	*f.* ♀ masumbrosus Gunder
57. cæsonia (Stoll)	*tr. f.* fanniæ Gunder
*caroliniana (Petiver) (pre-Linn.)	*tr. f.* newcombi Gunder
gen. autum. rosa (M'Neill)	—. cæsonia (Stoll.)
form rosæ (Roeber)	*f.* rosæ (Roeber)
	f. vern. rosa (M'Neill)
	f. immaculsecunda Gunder